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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/963,465	09/27/2001	Koji Hasegawa	KOJIM-428	9545

23599 7590 05/07/2003

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EXAMINER

THORNTON, YVETTE C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/963,465

Applicant(s)

HASEGAWA ET AL.

Examiner

Yvette C. Thornton

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This is written in reference to application number 09/963,465 filed on September 27, 2001, which was published as US 2002/0061465 A1 on May 23, 2002.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The Information Disclosure Statement filed on September 27, 2001 has been entered and fully considered.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

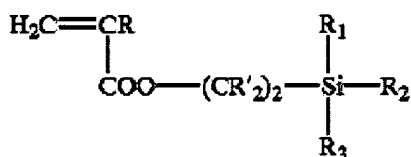
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Allen et al. (US 5,985,524 A). Allen claims a process for generating a bilayer resist image on a substrate comprising the steps of (a) coating a substrate with an organic underlayer; (b) coating the underlayer with a top layer comprising a radiation sensitive acid generator and a polymer

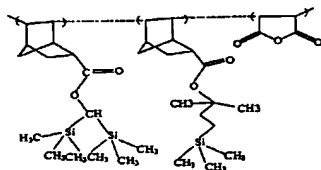
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formed by copolymerizing (i) hydroxystyrene with (ii) a second monomer and optionally with (iii) a third monomer optionally substituted with an acid cleavable group; (c) imagewise exposing the top layer to radiation; (d) developing the image in the top layer; and (e) transferring the image through the organic underlayer to the substrate (cl. 29; see also c. 3, l. 49-c. 4, l. 55). The second monomer of the said polymer preferably has the structure:



wherein R is hydrogen or methyl, R' is independently hydrogen, C₁₋₆ alkyl, phenyl or benzyl and R_{1,3} are independently selected from the group consisting of hydrogen, C₁₋₆ alkyl and Si(R₄)₃ wherein R₄ is independently hydrogen or lower alkyl (cl. 30). It is the examiner's position that the limitations of the instant claims are met when R_{1,3} of the taught structure are independently C₁₋₆ alkyl. Specifically, the said monomer would meet the limitations of claimed formula 2 wherein R¹⁻⁴ is hydrogen or alkyl group having 1-6 carbon atoms, m is 1, and R⁵⁻⁷ are alkyl groups.

5. Claims 1-4 and 8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Brock et al. (US 6,444,408 B1). Brock exemplifies in example 7, the synthesis of a terpolymer comprising bis(trimethylsilyl)methyl 5-norbornene-2-carboxylate, 2-(2-methyl-4-trimethylsilyl)butyl 5-norbornene-2-carboxylate and maleic anhydride having the structure:



(c. 8, l. 9-27). Example 11 exemplifies a silicon substrate coated

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with an organic underlayer and baked at 220°C for 2 minutes. The underlayer was then coated with a top imaging layer composition comprising the terpolymer of example 7, a photoacid generator and a solvent. The films were baked at 130°C for 1 minute to drive the solvent out. The films were then imagewise exposed at 193 nm, post-exposure baked at 130°C and developed with TMAH to form a pattern (c. 9, l. 1-35) Brock teaches that the last step of the process involves transferring the developed image in the top layer through the underlayer to the substrate by known techniques. Preferably, the image is transferred by etching with reactive ions such as oxygen plasma or oxygen/sulfur dioxide plasma (c. 5, l. 31-40). Figure 8 shows examples of silicon containing monomers having acid labile groups, which are suitable for the taught invention. The first two monomers on the first row; the second monomer on the second row; and all three monomers on the third row meet the limitations of the instant claims, specifically claimed formulae 2 and 4.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allen et al. (US 5,985,524 A) as applied to claims 1-4 above, and further in view of Allen et al. (US 5,580,694 A) and Choi (US 6,045,970 A).

Allen ('524) teaches all the limitations of the instant claims except it fails to claim the use of a basic compound and a dissolution inhibitor as set forth in instant claims 5-7. Allen ('524) also fails to disclose a pre-baking step as set forth in instant claim 8. Allen does however teach that the top imaging layer may optionally comprise other minor components such as dissolution inhibitors, coating enhancers, surfactants, bases and other compounds known to those in the art (c. 3, l. 38-41).

Allen (US 5,580,694) teaches the use of a mono-, di- or tri-protected hydroxy androstane-17-alkylcarboxylate as conventional dissolution inhibitors. Photogenerated free acid causes cleavage of the alkylcarboxylate ester to form free acid, converting the androstane molecule from dissolution inhibitor to dissolution enhancer. Preferred compounds are t-butyl 3-acetyllithocholate and t-butyl 3-trifluoroacetyllithocholate (c. 3, l. 1-46). One of ordinary skill in the art would have been motivated by the teaching of Allen to incorporate a dissolution inhibitor having an acid labile group such as t-butyl 3-acetyllithocholate and t-butyl 3-trifluoroacetyllithocholate into the taught composition of Allen ('254) in order to improve the etch resistance for subsequent process steps (Allen '694 c. 4, l. 54-55).

Choi (US 6,045,970 A) teaches that organic bases such as triethylamine, triisobutylamine and triethanolamine are used in photoresist compositions to prevent a decrease in the critical size of the pattern after exposure, caused by acid diffusing from an exposed portion of the photoresist to an unexposed portion (c. 4, l. 23-31). One of ordinary skill in the art would have been motivated by the teaching of Choi to incorporate a base such as triethylamine, triisobutylamine and triethanolamine into the taught composition of Allen ('524) in order to decrease the critical size of the pattern after exposure (Choi c. 4, l. 23-31).

Allen ('524) teaches that the undercoat organic layer is applied to the substrate and heated to an elevated temperature of 100-250°C for a short period of time to drive off the solvent. The components of the top imaging layer is then dissolved in a suitable solvent and coated onto the underlayer of organic polymer (c. 3, l. 58-c. 4, l. 12). It would have been obvious to one of ordinary skill in the art to do a second heating (pre-baking) step to drive off the solvent of the top imaging layer.

8. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brock et al. (US 6,444,408 B1) as applied to claims 1-4 and 8 above, and further in view of Allen et al. (US 5,580,694 A) and Choi (US 6,045,970 A).

Brock teaches all the limitations of the instant claims except it fails to exemplify the use of a basic compound and a dissolution inhibitor as set forth in instant claims 5-7. Brock does however teach that the top imaging layer may optionally comprise other minor components such as dissolution inhibitors, coating enhancers, surfactants, bases and other compounds known to those in the art (c. 4, l. 25-37).

Brock directs attention to Allen (US 5580694) for suitable dissolution inhibitors. Brock teaches the use of a mono-, di- or tri-protected hydroxy androstane-17-alkylcarboxylate. Photogenerated free acid causes cleavage of the alkylcarboxylate ester to form free acid, converting the androstane molecule from dissolution inhibitor to dissolution enhancer. Preferred compounds are t-butyl 3-acetylthiocholate and t-butyl 3-trifluoroacetylthiocholate (c. 3, l. 1-46). One of ordinary skill in the art would have been motivated by the teaching of Allen to incorporate a dissolution inhibitor having an acid labile group such as t-butyl 3-acetylthiocholate and t-butyl 3-trifluoroacetylthiocholate into the

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exemplified composition of example 11 of Brock in order to improve the etch resistance for subsequent process steps (Allen c. 4, l. 54-55).

Choi teaches that organic bases such as triethylamine, triisobutylamine and triethanolamine are used in photoresist compositions to prevent a decrease in the critical size of the pattern after exposure, caused by acid diffusing from an exposed portion of the photoresist to an unexposed portion (c. 4, l. 23-31). One of ordinary skill in the art would have been motivated by the teaching of Choi to incorporate a base such as triethylamine, triisobutylamine and triethanolamine into the exemplified composition of example 11 of Brock in order to decrease the critical size of the pattern after exposure (Choi c. 4, l. 23-31).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Mizutani et al. (US 6,506,535 B1) pertaining to a positive working photoresist composition.
- Lin et al. (US 6,210,856 B1) pertaining to a resist composition and process of forming a patterned resist layer on a substrate.
- Foster et al. (US 6,165,682 A) pertaining to radiation sensitive copolymers and photoresist compositions thereof.
- Kim et al. (US 6,103,448 A) pertaining to organometallic-containing acrylate or methacrylate derivatives and photoresists containing the polymers thereof.
- Hien et al. (US 6,063,543 A) pertaining to a radiation sensitive mixture and its use.
- Mizutani et al. (JP 2001-166482, machine translation) pertaining to positive type photoresist compositions.
- Sato et al. (JP 2001-194787, abstract) pertaining to positive type photoresist compositions.

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- Sato et al. (JP 2001-194788, abstract) pertaining to positive type photoresist compositions.
- Sato et al. (JP 2001-194789, abstract) pertaining to positive type photoresist compositions.
- Hatakeyama et al. (JP 2001-226432, abstract) pertaining to a polymer compound, chemical amplification resist material and method for forming patterns.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette C. Thornton whose telephone number is 703-305-0589. The examiner can normally be reached on Monday-Thursday 8-6:30.

11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet C. Baxter can be reached on 703-308-2303. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

12. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1495.



Yvette Clarke Thornton
Junior Examiner
Art Unit 1752

yct
May 2, 2003